

Name: Solutions

1. Solve $3x^2 - 11x - 4 = 0$ for real solutions.

$$(3x+1)(x-4) = 0$$

$$\left\{-\frac{1}{3}, 4\right\}$$

2. Solve $9k^2 - 25 = 0$ for real solutions.

$$(3k-5)(3k+5) = 0$$

$$\left\{\frac{5}{3}, -\frac{5}{3}\right\}$$

3. Solve $4w^2 + 20w + 25 = 0$ for real solutions.

$$(2w+5)(2w+5) = 0$$

$$\left\{-\frac{5}{2}\right\}$$

4. Solve $p^2 + 2p - 1 = 0$ for irrational solutions.

$$p = \frac{-2 \pm \sqrt{4 - 4(1)(-1)}}{2(1)} = \frac{-2 \pm \sqrt{4+4}}{2} = \frac{-2 \pm \sqrt{8}}{2} = \frac{-2 \pm 2\sqrt{2}}{2} = -1 \pm \sqrt{2}$$

5. Solve $m^3 - 27 = 0$ for real and imaginary solutions.

$$(m-3)(m^2+3m+9) = 0$$

$$m=3 \quad m = \frac{-3 \pm \sqrt{9-36}}{2} = \frac{-3 \pm \sqrt{-27}}{2} = \frac{-3 \pm 3i\sqrt{3}}{2} \quad \left\{3, \frac{-3 \pm 3i\sqrt{3}}{2}\right\}$$

6. Solve $8x^3 - 24x = 0$ for rational and irrational solutions.

$$8x(x^2-3) = 0$$

$$8x = 0$$

$$x = 0$$

$$x^2 - 3 = 0$$

$$x^2 = 3$$

$$x = \pm\sqrt{3}$$

$$\{0, \sqrt{3}, -\sqrt{3}\}$$

7. Solve $3y^3 + 6y^2 - 45y = 0$ for real solutions.

$$3y(y^2+2y-15) = 0$$

$$3y(y+5)(y-3) = 0$$

$$\{0, -5, 3\}$$

8. Solve $y^3 + 2y^2 - 9y - 18 = 0$ for real solutions.

$$y^2(y+2) - 9(y+2) = 0$$

$$(y+2)(y^2-9) = 0$$

$$(y+2)(y-3)(y+3) = 0$$

$$\{-2, 3, -3\}$$

9. Solve $z^4 - 13z^2 + 36 = 0$ for real solutions.

$$(z^2-4)(z^2-9) = 0$$

$$(z-2)(z+2)(z-3)(z+3) = 0$$

$$\{2, -2, 3, -3\}$$

10. Solve $z^4 - 8z^2 - 48 = 0$ for irrational and imaginary solutions.

$$(z^2-12)(z^2+4) = 0$$

$$z^2-12=0 \text{ or } z^2+4=0$$

$$z^2=12 \text{ or } z^2=-4$$

$$z = \pm\sqrt{12} \text{ or } z = \pm\sqrt{-4}$$

$$z = \pm 2\sqrt{3} \text{ or } z = \pm 2i$$

$$\{2\sqrt{3}, -2\sqrt{3}, 2i, -2i\}$$

11. Write a degree-3 polynomial equation in standard form with solution set $\{0, -5\}$ and with -5 as a double root.

$$(x-0)(x+5)(x+5) = 0$$

$$x(x^2+10x+25) = 0$$

$$x^3+10x^2+25x = 0$$

12. Write a degree-3 polynomial equation in standard form with solution set $\left\{4, \frac{-2}{3}, 1\right\}$.

$$x=4 \quad x=\frac{-2}{3} \quad x=1$$

$$x-4=0 \quad 3x+2=0 \quad x-1=0$$

$$(x-4)(3x+2)(x-1) = 0$$

$$(x-4)(3x^2-x-2) = 0$$

$$3x^3-13x^2+2x+8 = 0$$

13. Write a degree-3 polynomial equation in standard form with solution set $\{2, i, -i\}$.

$$x=2 \quad x=i \quad x=-i$$

$$(x-2)(x-i)(x+i) = 0$$

$$(x-2)(x^2+1) = 0$$

$$x^3-2x^2+x-2 = 0$$

14. Write a degree-3 polynomial equation in standard form with solution set

$$\{0, \sqrt{10}, -\sqrt{10}\}. \quad x=0 \quad x=\sqrt{10} \quad x=-\sqrt{10}$$

$$x-\sqrt{10}=0 \quad x+\sqrt{10}=0$$

$$x(x-\sqrt{10})(x+\sqrt{10}) = 0$$

$$x(x^2-10) = 0 \quad x^3-10x = 0$$

15. Simplify $\frac{10x+5}{5} = 2x+1$

16. Simplify $\frac{10x+21}{5} = 2x + \frac{21}{5}$

17. Simplify $\frac{10x+5}{15} = \frac{2x+1}{3}$ or $\frac{2x}{3} + \frac{1}{3}$

18. Simplify $\frac{x-5}{5-x} = -1$

19. Simplify $\frac{x^2+9}{x+3}$. already simplified

20. Simplify $\frac{x-5}{x^2-25} = \frac{x-5}{(x-5)(x+5)} = \frac{1}{x+5}$

21. Simplify $\frac{2x^2+9x-5}{2x^2-9x+4} = \frac{(2x-1)(x+5)}{(2x-1)(x-4)} = \frac{x+5}{x-4}$

22. Simplify $\frac{x^3-27}{x-3} = \frac{(x-3)(x^2+3x+9)}{x-3} = x^2+3x+9$

23. Simplify $\frac{x^2+5x-14}{x^2-7x+10} \times \frac{x^2-x-20}{x^2+10x+21} = \frac{(\cancel{x+7})(\cancel{x-2})(\cancel{x-5})(x+4)}{(\cancel{x-2})(\cancel{x-5})(x+3)(\cancel{x+7})} = \frac{x+4}{x+3}$

24. Simplify $\frac{x^2-16}{x^2-13x+40} \div \frac{x^2+8x+16}{x^2-x-20} = \frac{(\cancel{x-4})(\cancel{x+4})(\cancel{x-5})(\cancel{x+4})}{(\cancel{x-5})(x-8)(\cancel{x+4})(\cancel{x+4})} = \frac{x-4}{x-8}$

25. State all real number restrictions on x : $\frac{x^2+8x+16}{2x+5}$.

$$\begin{aligned} 2x+5 &\neq 0 \\ 2x &\neq -5 \\ x &\neq -\frac{5}{2} \end{aligned}$$

26. State all real number restrictions on x : $\frac{x^4-5x^2+4}{2x^3-18x}$.

$$2x(x^2-9)$$

$$2x(x-3)(x+3)$$

$$2x \neq 0$$

$$x-3 \neq 0$$

$$x+3 \neq 0$$

$$x \neq 0$$

$$x \neq 3$$

$$x \neq -3$$

27. State all real number restrictions on x : $\frac{x^2-49}{x^2+49}$.

real numbers will not cause x^2+49 to be zero.
There are no real number restrictions